USSN 09/833,713
Art Unit: 1762

Amendments to Specification

Please amend the title to read:

--Method of depositing optical quality silica films by PECVD while controlling gas pressure--

Please replace the paragraph commencing at line 26, page 8, with a new paragraph as follows:

-- The ~~High~~ high temperature thermal treatments also have their own shortcomings. Optical quality silica films typically require a post-deposition thermal treatment at a high temperature as high as 1350°C in order to eliminate residual optical absorption peaks in the 1.30 to 1.55 μm optical region. --

Please replace the paragraph commencing at line 12, page 10, with a new paragraph as follows:

-- Typically the deposition is carried out with SiH_4 as a raw material gas. N_2O as an oxidation gas is, and N_2 as a carrier gas, although other materials can be used.--

Please replace the paragraph commencing at line 25, page 10, with a new paragraph as follows:

-- The novel PECVD approach in accordance with the invention can provide undoped (no B and/or P) silica films from the oxidation of silane, SiH_4, using nitrous oxide, N_2O. ~~It will then focus on the effect of additional nitrogen, N_2, reactant gas.~~

Please cancel the paragraph commencing at line 1, page 11, with as follows:

~~-- This discussion will not consider means of adding ammonia, NH_3, fluorine, F, phosphorus, P, boron, B, or other compounds or elements as a way to control refractive indexes.~~

Please replace the paragraph commencing at line 14, page 15, with a new paragraph as follows:

-- Figure ~~4~~ 3 lists the possible chemical reactions (i.e. thermal decomposition reactions) that may result from the exposure of the thirty-five (35) potential as-deposited compounds to nitrogen at very high temperature. Again, the thermal decomposition reactions (producing a potential post-treatment compound after the high temperature thermal treatment which is different then the potential as-deposited compound before high temperature thermal treatment) have to preserve the need to accommodate the chemical bonds of their constituting atoms. These various reactions present a very clear overview of the limitations of these high temperature thermal treatments.--

Please replace the paragraph commencing at line 6, page 17, with a new paragraph as follows:

unknown oscillators (which does not have a higher harmonics which could cause optical absorption in the 1.30 to 1.55 μm optical bands) at any of the deposition pressures. This limitation is not that important since only the fourth harmonics of the Si=O oscillators which can absorb in the 1.30 to 1.55 μm optical bands. --

Please replace the paragraph commencing at line 24, page 26, with a new paragraph as follows:

-- Figure ~~10b~~ 9b shows the in-depth FTIR spectra from 2200 to 2400 cm^{-1} of silica films obtained with the improved PECVD deposition technique after a three hours long high temperature thermal treatment in a nitrogen ambient at a low temperature of 800°C. This region focuses on the Si-H oscillators (centered at 2260 cm^{-1}) of the various residual post-treatment compounds of Figure 4. It is clear that the Si-H oscillators (which third harmonics could cause an optical absorption between 1.443 and 1.508 μm) are completely eliminated for all deposition pressures. --

Please replace the paragraph commencing at line 3, page 27, with a new paragraph as follows:

-- Figure ~~11b~~ 10b shows the in-depth FTIR spectra from 3200 to 3900 cm^{-1} of silica films obtained with the improved PECVD deposition technique after a three hours long high temperature thermal treatment in a nitrogen ambient at a low temperature of 800°C. This region focuses on the Si:N-H oscillators (centered at 3380 cm^{-1}), on the SiN-H oscillators (centered at 3420 cm^{-1}), on the SiO-H oscillators (centered at 3510 cm^{-1}) and on the HO-H oscillators (centered at 3650 cm^{-1}) of the various residual post-treatment compounds ~~described by~~listed in Figure 43. It is clear that all these oscillators are gradually eliminated as the deposition pressure is increased from 2.00 to 2.60 Torr. --

Please replace the paragraph commencing at line 6, page 28, with a new paragraph as follows:

-- A systematic comparison between: (Figures 5a and 5b), (Figures 6a and 6b), (Figures 7a and 7b), (Figures 8a and 8b), (Figures 9a and 9b) as well as (Figures 10a and 10b) shows the spectacular benefits of the improved PECVD deposition technique which results in a substantially total elimination of the various undesirable Si-O_x-H_y-N_z potential post-treatment compounds after a low temperature (800°C) thermal treatment in a nitrogen ambient and in particular of the residual SiONH post-treatment compounds which can still be detected by the residual Si:N-H oscillators (centered at 3380 cm^{-1} and which second harmonics

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6.(currently amended) A method as claimed in claim 41, wherein said film is deposited in a vacuum chamber whose pressure is maintained by a vacuum pump having a controllable pumping speed, and said total gas pressure is maintained by controlling said pumping speed.

7.(currently amended) A method as claimed in claim 41, wherein said film is deposited at a temperature between 100 and 650°C.

8.(original) A method as claimed in claim 7, wherein said film is deposited at a temperature of about 400°C.

9.(cancelled)

10.(currently amended) A method as claimed in claim 91, wherein said ~~reactive~~ silicon-containing gas is selected from the group consisting of: silicon tetra-chloride, $SiCl_4$, silicon tetra-fluoride, SiF_4, disilane, Si_2H_6, dichloro-silane, SiH_2Cl_2, and difluoro-silane, SiH_2F_2 ~~and any other silicon containing gases involving the use of hydrogen, H, chlorine, Cl, fluorine, F, bromine, Br, and iodine, I~~.

11.(currently amended) A method as claimed in claim 10, wherein said ~~oxidation~~ oxygen-containing gas is selected from the group consisting of: oxygen, O_2, nitric oxide, NO_2, water, H_2O, hydrogen peroxide, H_2O_2, carbon monoxide, CO ~~or~~ and carbon dioxide, CO_2.

12.(original) A method as claimed in claim 11, wherein said carrier gas is selected from the group consisting of: helium, He, neon, Ne, argon, Ar or krypton, Kr.

13.(currently amended) A method as claimed in claim ~~9~~ 1 wherein said ~~raw material~~ silicon-containing gas is SiH_4, said ~~oxidation~~ oxygen-containing gas is N_2O, and said carrier gas is N_2 ~~carrier gas~~.

14.(currently amended) A method as claimed in claim 91, wherein the predetermined flow rates of said gases are ~~also controlled~~ selected to optimize the quality of the deposited films after said low temperature treatment.

15.(original) A method as claimed in claim 13, wherein the flow rates of said gases are ~~also controlled~~ selected to optimize the quality of the deposited films after said low temperature treatment.

CERTIFICATE OF TRANSMISSION BY FACSIMILE (37 CFR 1.8)	Docket No. 10932-US

Applicant(s): Luc OUELLET

Serial No.	Filing Date	Examiner	Group Art Unit
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Invention: OPTICAL QUALITY SILICA FILMS

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